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(54) **SYSTEM AND METHOD FOR ADAPTIVE MEDIA BUNDLING FOR VOICE OVER INTERNET PROTOCOL APPLICATIONS**

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H04L 29/06	(2006.01)
H04W 4/10	(2009.01)
H04L 29/02	(2006.01)
H04L 29/08	(2006.01)
H04W 28/06	(2009.01)
H04W 76/00	(2009.01)

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CPC ***H04L 41/0213*** (2013.01); ***H04L 29/02*** (2013.01); ***H04L 29/06*** (2013.01); ***H04L 67/303*** (2013.01); ***H04W 4/10*** (2013.01); *H04W 28/06* (2013.01); *H04W 76/005* (2013.01)

(58) **Field of Classification Search**

CPC H04L 29/02
USPC 370/474

See application file for complete search history.

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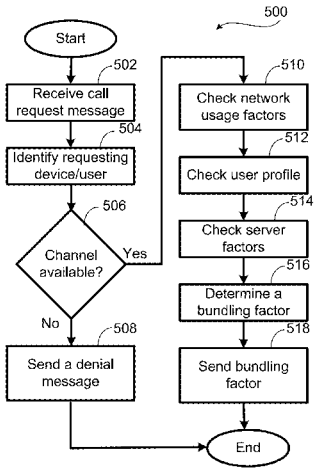
(57) **ABSTRACT**

An apparatus and method for adaptively bundling media frames in a data packet for transmission in a wireless data network. When a wireless device is ready to transmit an audio communication, a message is sent from the wireless device to a communication server that checks for network usage conditions and adaptively determines a bundling factor for the audio communication. The bundling factor is transmitted to the wireless device, and the wireless device bundles media frames into a data packet according to the bundling factor.

23 Claims, 6 Drawing Sheets



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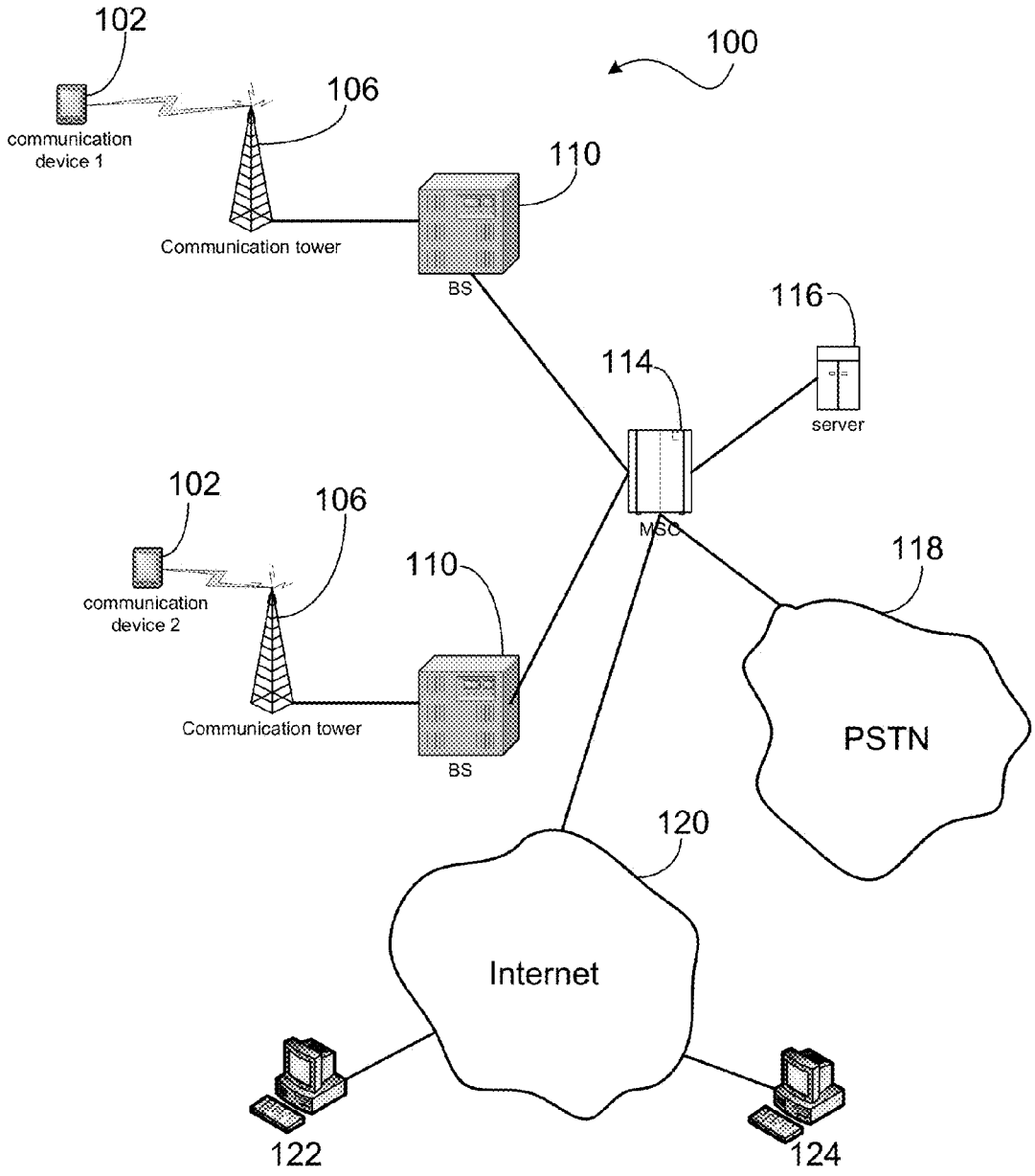

FIG. 1
(Prior Art)

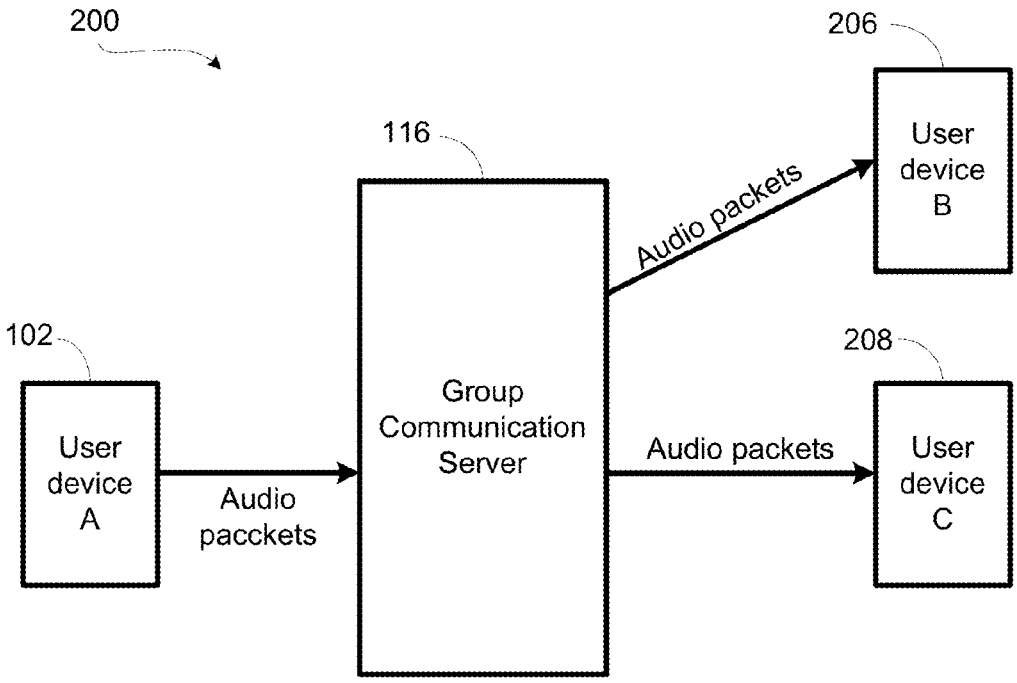

FIG. 2
(Prior Art)

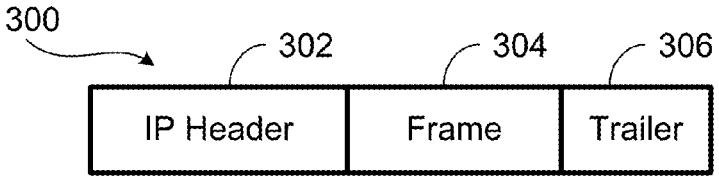

FIG. 3
(PRIOR ART)

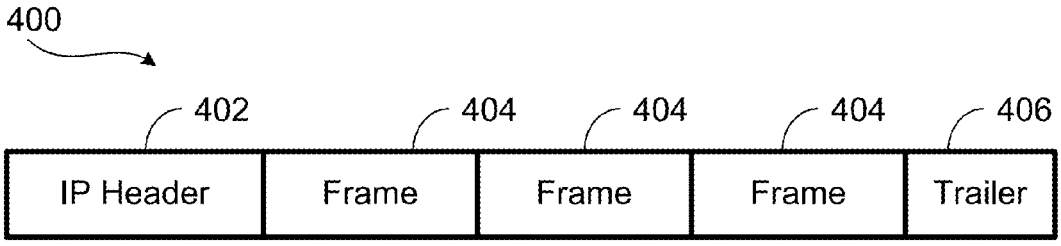

FIG. 4
(PRIOR ART)

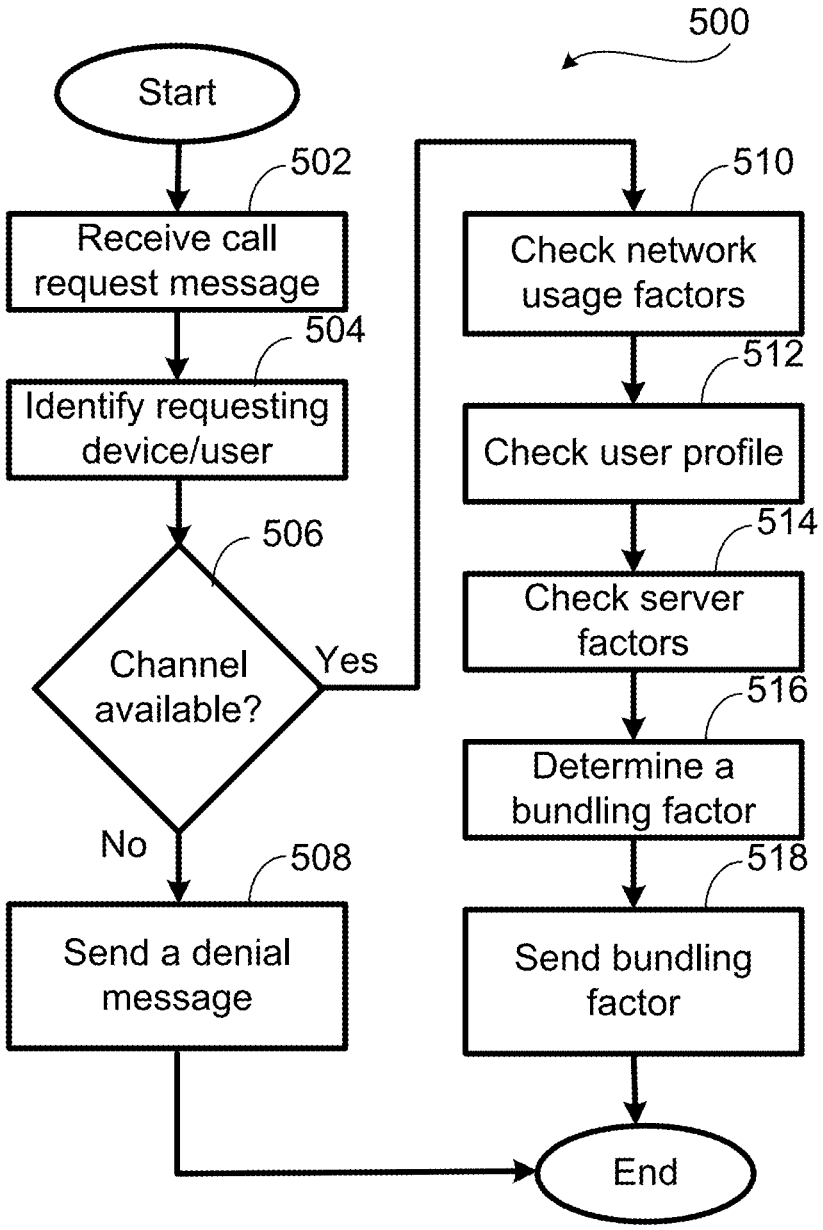
500
Start
502
Receive call request message
504
Identify requesting device/user
506
Channel available?
Yes
No
508
Send a denial message
510
Check network usage factors
512
Check user profile
514
Check server factors
516
Determine a bundling factor
518
Send bundling factor
End

FIG. 5

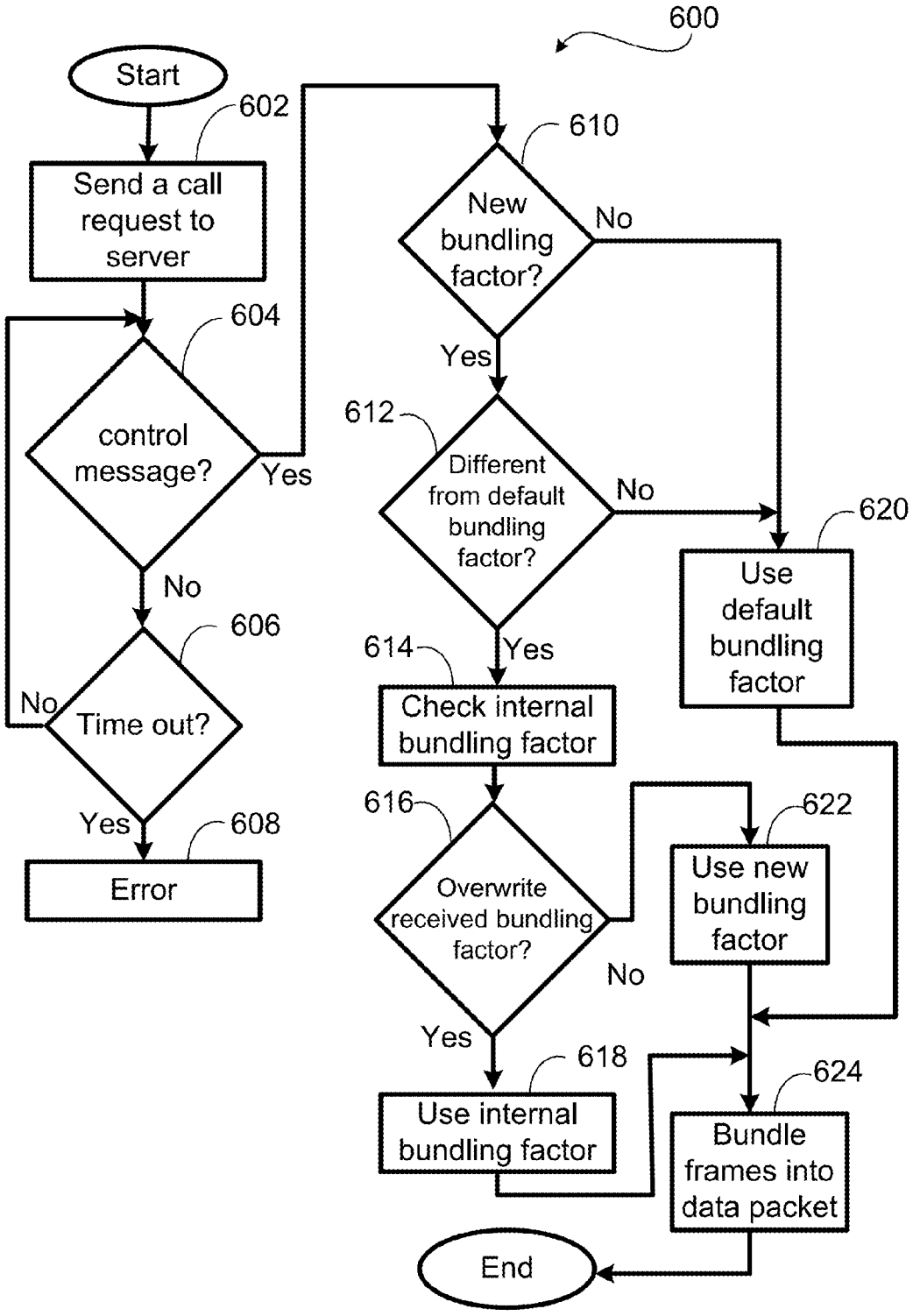
600
Start
602
Send a call request to server
604
control message?
Yes
No
606
Time out?
No
Yes
608
Error
610
New bundling factor?
No
Yes
612
Different from default bundling factor?
No
Yes
614
Check internal bundling factor
616
Overwrite received bundling factor?
No
Yes
618
Use internal bundling factor
620
Use default bundling factor
622
Use new bundling factor
624
Bundle frames into data packet
End

FIG. 6

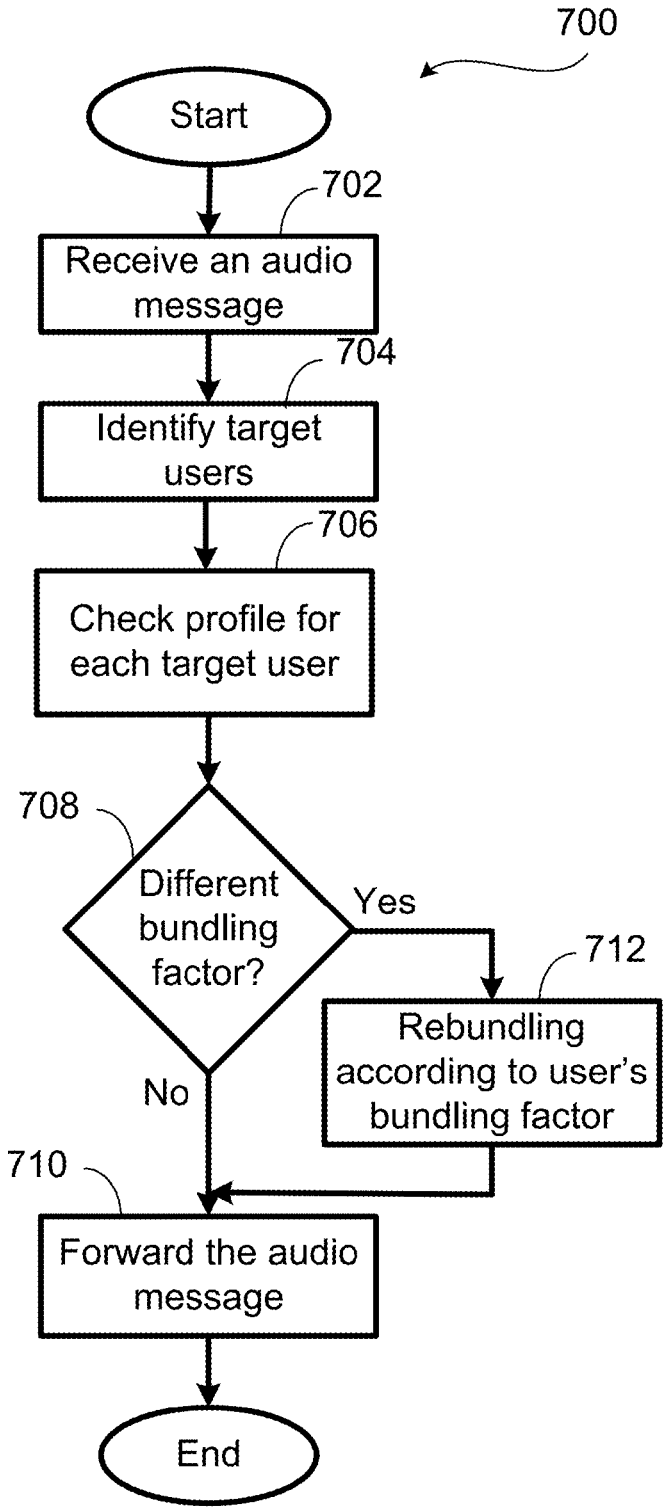
700
Start
702
Receive an audio message
704
Identify target users
706
Check profile for each target user
708
Different bundling factor?
Yes
712
Rebundling according to user's bundling factor
No
710
Forward the audio message
End

FIG. 7

SYSTEM AND METHOD FOR ADAPTIVE MEDIA BUNDLING FOR VOICE OVER INTERNET PROTOCOL APPLICATIONS

CLAIM OF PRIORITY UNDER 35 U.S.C. §120

The present application for patent is a continuation of patent application Ser. No. 11/256,345, entitled "System and Method of Adaptive Media Bundling for Voice Over Internet Protocol Applications," filed on Oct. 20, 2005, pending, assigned to the assignee hereof, and expressly incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to wireless telecommunications, and more specifically, relates to a system and method for adaptively increasing the efficiency of audio data transmission over a communication network.

2. Description of the Related Art

Technology advancement has made mobile telephones or wireless communications devices inexpensive and accordingly ubiquitous. As wireless telecommunication devices are manufactured with greater processing ability and storage, they also become more versatile and incorporate many features including direct radio communication capability between two or a group of individual handsets. This direct radio communication capability is commonly known as the push-to-talk (PTT) or "walkie-talkie" feature that allows a user with one handset to communicate with the device of a predefined set of members of a group without dialing a destination telephone number.

In one version of a PTT system, a wireless telecommunication device, such as a handset, uses one single frequency for both upward and downward communications with a remote PTT server, while in a normal wireless communication a wireless telephone uses two frequencies for communicating with the PTT server, one for outgoing and one for incoming communications. The PTT system requires the person who is speaking to press a PTT button while talking and then release it when done. Any listener in the group can then press their button to respond. In this manner, the system determines which direction the signal travels. In a typical configuration, when a user makes a call to a receiving party or a group of receiving parties using the PTT system, the user's handset first makes a request to a remote server by informing the server it is ready to transmit. The remote PTT server verifies that no other party is using the communication channel and the channel is available then assigns the channel to the user. The user's message is received by the server and the server sends the message for each and every receiving party. After the message is transmitted to every receiving party, the channel is released and ready for use by other parties.

During the process described above, the audio from one user is sampled and digitized by a device, such as vocoder, at the handset. The digitized data is then assembled into frames and the frames are packed into data packets and transmitted over the air to the server. The server receives the data packets and sends them to their destinations. At their destination, the digitized data are extracted from the data packets, reassembled into audio streams, and played to the receiving party. In each data packet there may be one or more frames. Usually, the number of frames is set by the network standards or network service providers, and is independent of network conditions.

The network efficiency is increased when more frames are packed into a single data packet, and the efficiency is at its lowest when there is only one frame per data packet. However, incrementing the number of the frames per data packet also increases the delay at the user's handset. The handset has to wait for audio data from the user, assemble the audio data into multiple frames, and pack the multiple frames into one data packet before transmitting the data packet to the server.

Therefore, it is desirous to have an apparatus and method that enables a server to adaptively bundle different number of frames into a single data packet, such that the network efficiency is increased and it is to such apparatus and method the present invention is primarily directed.

SUMMARY OF THE INVENTION

Briefly described, the invention is the apparatus and method that adaptively bundles media frames in a data packet for transmission in a data network. When a wireless device is ready to transmit an audio communication, a message is sent from the wireless device to a communication server. The communication server then checks for network usage conditions and adaptively determines a bundling factor for the audio communication. The bundling factor is transmitted to the wireless device, and the wireless device bundles media frames into a data packet according to the bundling factor.

In one embodiment, the method determines a media bundling factor for adaptively bundling media frames in a data packet transmitted between a communication server and a user device during a communication in a data communication network. The method includes the steps of receiving at the communication server an audio transmission request from the user device, checking at least one network usage parameter from the data communication network, determining a media bundling factor that specifies the number of media frames bundled in one data packet according to the at least one network usage parameter, and transmitting from the communication server the media bundling factor along with a control message to the user device, wherein the user device adaptively bundles media frames according to the media bundling factor.

In another embodiment, the method determines a media bundling factor for adaptively bundling media frames in a data packet transmitted between a communication server and a user device during a communication in a data communication network. The method includes the steps of transmitting from the user device an audio transmission request to the communication server, receiving at the user device a media bundling factor along with a control message from the communication server, and checking a user device factor to select an actual bundling factor. The actual bundling factor specifies the number of media frames bundled in one data packet and the user device factor has at least a true state and a false state. If the user device factor is true, then the media bundling factor is used as the actual bundling factor; if the user device factor is false, then a predefined bundling factor is used as the actual bundling factor. The method further includes the steps of bundling media frames into a data packet according to the actual bundling factor, and transmitting the data packet with the bundled media frames from the user device to the communication server.

In yet another embodiment, the user device is capable of communicating with a remote communication server through a wireless network. When the user device is ready to transmit an audio communication to the communication server, the user device checks at least one internal factor, determines a media bundling factor for adaptively bundling media frames

of the audio communication into a data packet transmitted between the user device and the communication server, and bundles the media frames into a data packet according to the media bundling factor.

In yet another embodiment, a communication server is provided as capable of determining a media bundling factor for adaptively bundling media frames in a data packet transmitted between the communication server and a user device during a communication in a data communication network. The server, upon receiving an audio transmission request from the user device, checks at least one network usage parameter from the data communication network, determines a media bundling factor according to the at least one network usage parameter, wherein the media bundling factor specifies the number of the media frames in one data packet, and transmits the media bundling factor along with a control message to the user device such that the user device can adaptively bundle media frames according to the media bundling factor.

In yet another embodiment, the user device is capable of determining a media bundling factor for adaptively bundling media frames in a data packet transmitted between the user device and a communication server during a communication in a data communication network. The user device, when ready to transmit an audio transmission to the communication server, transmits from the user device an audio transmission request to the communication server, receives at the user device a media bundling factor along with a control message from the communication server, checks a user device factor to select an actual bundling factor. The actual bundling factor specifies the number of media frames bundled in one data packet, and the user device factor has at least a true state and a false state. If the user device factor is true, the media bundling factor is used as the actual bundling factor; if the user device factor is false, a predefined bundling factor is used as the actual bundling factor. The user device further bundles media frames into a data packet according to the actual bundling factor, and transmits the data packet with the bundled media frames from the user device to the communication server.

The present system and methods are therefore advantageous as they enable a wireless communication device to efficiently transmit data packets to a server during a PTT communication. Other advantages and features of the present invention will become apparent after review of the hereinafter set forth Brief Description of the Drawings, Detailed Description of the Invention, and the Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** depicts a prior art communication network.

FIG. **2** is a simplified prior art communication diagram between a server and a wireless devices.

FIG. **3** is a prior art data packet with a single frame.

FIG. **4** is a prior art data packet with multiple frames.

FIG. **5** is a flow chart illustrating an exemplary embodiment of a server process for determining a bundling factor.

FIG. **6** is a flow chart illustrating an exemplary embodiment of a user device process for determining a bundling factor.

FIG. **7** is a flow chart illustrating an exemplary embodiment of a server forwarding an incoming audio message to a plurality of target users.

DETAILED DESCRIPTION OF THE INVENTION

In this description, the terms "communication device," "wireless device," "user device," "PTT communication device," "handheld device," and "handset" are used interchangeably are used interchangeably. As used herein, the term "exemplary" only indicates that what is described in an example, and in no way is intended to indicate preference or otherwise limit the invention to the embodiment described. Further, like numerals refer to like elements throughout the several views, and the articles "a" and "the" includes plural references, unless otherwise specified in the description.

In overview, the apparatus and method adaptively bundle media frames in a data packet for transmission over a data network. When a wireless device is ready to transmit an audio communication, a message is sent from the wireless device to a communication server. The communication server then checks for network usage conditions and adaptively determines a bundling factor for the audio communication. The bundling factor is transmitted to the wireless device, and the wireless device bundles media frames into a data packet according to the bundling factor. FIG. **1** depicts a prior art communication network **100**. The communication network **100** includes one or more communication towers **106**, each connected to a base station (BS) **110** and serving users with communication device **102**. The communication device **102** can be cellular telephones, pagers, personal digital assistants (PDAs), laptop computers, or other hand-held, stationary, or portable communication devices that support push-to-talk (PTT) communications. The commands and data input by each user are transmitted as digital data to a communication tower **106**. The communication between a user using a communication device **102** and the communication tower **106** can be based on different technologies, such code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), the global system for mobile communications (GSM), or other protocols that may be used in a wireless communications network or a data communications network.

The PTT communications are digitized and placed into frames. The frames are transmitted through data packets over the communication network **100**. The wireless communication device **102** sends and receives audio data packets on an assigned communication channel and control data are sent and received through a data channel. The data packets from each device is sent from the communication tower **106** to a base station (BS) **110**, and forwarded to a mobile switching center (MSC) **114**, which may be connected to a public switched telephone network (PSTN) **118** and the Internet **120**. The MSC **114** may be connected to a server **116** that supports the PTT feature in the communications network **100**. Optionally, the server **116** may be part of the MSC **114**. The server **116** may also suppress transmission of PTT communication to a particular wireless device upon request from that device. The data packets are forwarded by the server **116** to the receiving wireless device **102** where an audio stream will be constructed based on the data in the data packets. In an alternative embodiment (not shown), the MSC **114** may not be needed in a data-only network. The data packets are sent by the BS **110** to a packet data serving node and/or other servers for processing. The data packets are transmitted between the wireless device **102** and the BS **106** according to a predefined protocol such as Real-time Transport Protocol (RTP), TCP/IP, user datagram protocol (UDP)/IP, or other suitable protocols.

An originating wireless device **102**, when ready to engage in a PTT communication, sends a call message through the base station **110** to the server **116**. The server **116** sends an announce message to the base station **110**. The announce message is queued at the base station **110** until the targeted wireless device **102** is located. The base station **110** uses a

page message to locate the targeted wireless device **102**. After receiving a response from the targeted wireless device **102**, the base station **110** delivers the announce message to the targeted wireless device **102**. The targeted wireless device **102** acknowledges the announce message, and this acknowledgement message is forwarded by the base station **110** to the server **116**. After confirming the targeted wireless device **102** is available, the server **116** sends a status message to the originating wireless device **102**. The originating wireless device **102** can then start to transmit the PTT communication.

FIG. **2** is a simplified prior art diagram **200** representing interactions between the server (also known as group communication server) **116** and wireless devices **102**, **206**, **208** during a PTT communication process. The base stations **110** are omitted from FIG. **2**. A communication does not occur between an initiating wireless device **102** and a server **116** until a user activates a PTT button. After the user activates the PTT feature, the wireless device **102** sends a message to the server **116** indicating it is ready to transmit a PTT message. Upon receiving the message from the wireless device **102**, the server **116** determines the target wireless devices **206**, **208** to which the PTT communication is directed and pages the wireless devices **206**, **208**.

The PTT communication from the wireless device **102** to the server **116**, is broadcasted to the target wireless device **206**, **208** and digitized by a vocoder and put in frames. A PTT communication may be put into one frame or split into multiple frames. Frames are put into data packets and sent to its destination. FIG. **3** illustrates a prior art data packet **300**. The data packet **300** has generally three parts: header **302**, body (payload) **304**, and trailer **306**. The packet header **302** usually includes a start flag or a set of framing bits, control information (frame numbers), and address information. The payload **304** includes frames with the data being transported. The trailer **306** includes data bits used to error detection and correction and an end flag.

When a data packet is transported through a network, its header and trailer are processed by each server along its path. The network efficiency is increased when more frames are placed into a single data packet as shown in FIG. **4**. The prior art data packet **400** includes one header **402**, multiple frames **404**, and one trailer **406**. Because more data are transported through the multiple frames **404** while the size of the header **402** and trailer **406** remain fairly constant, the data transfer rate is increased.

However, the increase of the number of frames per data packet also increase the latency of data transfer since a data packet will not be sent until multiple frames of data are assembled. The processing of data and packaging multiple frames causes a delay that might be noticeable to users.

There is provided a method to dynamically set a bundling factor for bundling frames into a data packet. The bundling factor is set according to network conditions and usage. The bundling factor is generally set by the server **116** after considering many different factors, such as the number of active users on line, the current network load, etc. The bundling factor is communicated to the user wireless device **102** and the user wireless device **102** then bundles frames into a data packet according to the bundling factor. Alternatively, the user wireless device **102** may override the bundling factor received from the server **116** with its own internal bundling factor if certain conditions are met.

FIG. **5** is a flow chart illustrating a server process **500**. The server **116** receives a call request message from a user wireless device **102**, step **502**, after the user activates a PTT button. The server **116** identifies the requesting device, step **504**, and checks whether a communication channel is available, step **506**. If a communication channel is not available, the server **116** sends a denial message to the user wireless device **102**, step **508**. If the communication channel is available, the server **116** proceeds to check network usage factors, step **510**. The network usage factor can include, as way of example and not limited to, traffic volume, time of day, number of users in one region, and measured packet delay variation of the media stream. The network usage factor can be received from a network traffic server, such as a MSC **114** or a network switch (not shown), or otherwise received by the server **116**. The server **116** also checks the user profile, step **512**, and server factors, step **514**. The user profile can determine the quality of service to which the user has subscribed, or that has been assigned to the particular call. If the user is a fireman or a police officer, the bundling factor may be set low, so a higher quality of service can be delivered to the emergency communication. The quality of service may be affected by the bundling of data packets. The server factors can include, as way of example and not limited to, the number of registered users on line, the number of active users on the PTT communication, traffic volume on the server, and whether the call is an initial or subsequent talk segment for a given call. When the call is the initial talk segment between the parties, there is a delay to set up a communication channel for the communication. Therefore, the bundling factor should be set low to minimize additional delay caused by sampling and digitizing of the audio communication. For the subsequent talk segments, the communication channel has already been set up; therefore, the bundling factors can be set higher and additional delay may not be noticeable to the users.

After checking the network usage factors, user profile, and server factors, the server **116** determines a bundling factor for the communication, step **516**, and sends the bundling factor to the requesting wireless user device **102**, step **518**. The bundling factor may be sent with a channel message or other control messages to the requesting wireless user device **102**. The server **116** may also opt for not sending any bundling factor to the user device **102** if there is no overriding condition and the user device **102** can continue to send data packets as it did before.

FIG. **6** is a flow chart for a user device process **600**. After a user activates the PTT button, the originating wireless device (user device) **102** sends a call request message, step **602**, through wireless communication to the server **116** and awaits for a control message from the server **116**, step **604**. The control message may be a channel grant message or any other control messages sent from the server **116** to the user device **102**. If the control message is not received from the server **116** within a predefined period, a time out will occur and an error condition is generated, step **608**. After the control message is received, the user device **102** checks whether it includes a bundling factor, step **610**. If the control message does not include any bundling factor, the user device **102** uses its default bundling factor, step **620**, and bundles the frames into data packets according to the bundling factor, step **624**. The default bundling factor may be one or any number that was set previously.

If a new bundling factor is included in the control message, the user device **102** checks whether it is different from the default bundling factor, step **612**. If the received bundling factor is the same as the default bundling factor, then the default bundling factor is used, step **620**. If the received bundling factor is different from the default bundling factor, the user device **102** checks its internal bundling factor, step **614**. The user device **102** may have an internal bundling factor that is set according to the user device's unique internal operating condition. The user device **102** then checks whether

the internal bundling factor should override the received bundling factor, step **616**. The user device **102** may consider many factors, such as its computing power and memory size, in deciding whether to override the received bundling factor.

If the user device's internal operating condition justifies, the user device **102** will use its internal bundling factor in lieu of the received bundling factor, step **618**, as the actual bundling factor to bundle the frames into data packets, step **624**. If the user device internal operating condition is not present, then the user device **102** uses the new bundling factor received from the server **116**, step **622**, as the actual bundling factor to bundling the frames into data packets, step **624**.

FIG. **7** illustrates a flow chart for a server process **700** that forwards audio messages received from a user device **102** to a plurality of target user devices **102**. The server **116** receives an audio message (data packets relating to an audio message), step **702**, and identifies the targeted users, step **704**. After identifying the targeted users, the server **116** checks the profiles of each targeted user to learn the special bundling factor for the user, step **706**. Each user may set a special bundling factor according to the properties and characteristics of his user device or his preference. Each user may have a user device that has different bundling requirements/capabilities when transmitting and receiving media files. The server **116** then check if the special bundling factor is different from what has been used for the received data packet, step **708**. If the special bundling factor is the same as the one used for the incoming data packet, the server **116** forwards the data packet to the user, step **710**. If the special bundling factor is different from the one used for the incoming data packet, then the server **116** retrieves the frames from the incoming data packets and re-bundles the frames into new data packets according to the special bundling factor for the user, step **712**. The server **116** is capable of forwarding the incoming data packets to their multiple destinations with different a bundling factor for each destination.

The ability for the server **116** to independently bundle a received data packet with different bundling factors depending on the destinations of the received data packet is important because this allows the server **116** to bridge networks that treat media data differently. The ability for a media server to adaptively bundle media frames into data packets is an important enabling capability for certain interoperability use cases.

The following is a use scenario description. When a user wants to communicate with members of his PTT communication group, he presses a PTT button on his user device and a call request message is sent from his user device to a PTT communication server. The PTT server receives the call request message and verifies that a channel is available for the user device. Before granting the "floor" to the user device, the PTT server checks the user profile to learn whether the user has subscribed to a high quality PTT communication. The PTT server also checks whether the message is for an initial talk segment. If the request is an initial talk segment, the PTT server needs to set up a communication channel between the user and other receiving members. The PTT server further checks how many active members are being served by the PTT server and the current condition of the network traffic volume. After checking all the pertinent factors, the PTT server sets a low bundling factor for the communication since the request is for an initial talk segment and the traffic volume is relatively low. The bundling factor is then sent to the requesting user device **102** along with a control message.

The user device **102** receives the control message and checks whether there is any bundling factor attached. After retrieving the bundling factor from the control message, the user device **102** checks its own internal bundling factor and the default bundling factor. Alternatively, the default bundling factor may be a bundling factor used in the last communication. After checking its operating condition, the user device **102** decides not to override the received bundling factor and uses it to bundle the frames with digitized audio data into the data packets. For subsequent audio transmissions, the server may set the bundling factor to a higher value if the network traffic volume increases or the server loads increase. When the bundling factor is higher, there will be more payload data transferred per header.

In an alternative embodiment, the user device **102** can send a message with a preferred bundling factor to the server **116**, wherein the preferred bundling factor will be used with communications involving the user device **102**. This allows the user device **102** to set the preferred bundling factor at the server **116**. This preferred bundling factor may be stored in the user profile, which is checked by the server **116** before determining a bundling factor for the communication that involves the user device **102**. The preferred bundling factor may be determined by the physical characteristics of the user device **102**.

In yet another alternative embodiment, the user device **102** may set a bundling factor by checking its internal information without any suggestion or influence from the network or from the server **116**. The user device **102** may check a user preference or user profile stored in the user device **102**. The user device **102** may also select the bundling factor based on a call priority assigned to the call. The ability for each user device **102** to set up its own bundling factor independent from any input from a server enables direct, end-to-end communications between two user devices.

Although the description above is based on the wireless transmission of a PTT communication, the invention is equally applicable non-PTT communications, such as data transfer between two computing devices **122** and **124** illustrated in FIG. **1**. The two computing devices **122** and **124** may be maintaining an audio communication over the Internet (VoIP applications). The bundling factor may be set by a network server taking in consideration the traffic volume and other factors of the data communication network **120** connecting the two computing devices **122** and **124**. Alternatively, two computing devices **122** and **124** may be able to determine the bundling factor as described above, thus allowing a direct communication, without assistance of a server, between the two computing devices **122** and **124**.

In view of the method being executable on a wireless service provider's computer device or a wireless communications device, the method can be performed by a program resident in a computer readable medium, where the program directs a server or other computer device having a computer platform to perform the steps of the method. The computer readable medium can be the memory of the server, or can be in a connective database. Further, the computer readable medium can be in a secondary storage media that is loadable onto a wireless communications device computer platform, such as a magnetic disk or tape, optical disk, hard disk, flash memory, or other storage media as is known in the art.

In the context of FIGS. **5-7**, the steps illustrated do not require or imply any particular order of actions. The actions may be executed in sequence or in parallel. The method may be implemented, for example, by operating portion(s) of the wireless network, such as a wireless communications device or the server, to execute a sequence of machine-readable instructions. The instructions can reside in various types of signal-bearing or data storage primary, secondary, or tertiary media. The media may comprise, for example, RAM (not shown) accessible by, or residing within, the components of

the wireless network. Whether contained in RAM, a diskette, or other secondary storage media, the instructions may be stored on a variety of machine-readable data storage media, such as DASD storage (e.g., a conventional "hard drive" or a RAID array), magnetic tape, electronic read-only memory (e.g., ROM, EPROM, or EEPROM), flash memory cards, an optical storage device (e.g. CD-ROM, WORM, DVD, digital optical tape), paper "punch" cards, or other suitable data storage media including digital and analog transmission media.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the present invention as set forth in the following claims. Furthermore, although elements of the invention may be described or claimed in the singular, the plural is contemplated unless limitation to the singular is explicitly stated.

What is claimed is:

1. A method for determining a media bundling factor for adaptively bundling media frames in a data packet transmitted between a communication server and a user device during a communication in a data communication network, the method comprising:

transmitting from the user device an audio transmission request through a base station to the communication server;

receiving at the user device the media bundling factor and a control message from the communication server, wherein the media bundling factor specifies a first number of media frames bundled in one data packet;

checking a user device factor that defines an internal operating condition or a user-specific characteristic corresponding to the user device, wherein the user device factor comprises a do not override state or an override state;

identifying a user device-specific bundling factor corresponding to the user device factor, wherein the user device-specific bundling factor is respectively set according to the internal operating condition or the user-specific characteristic corresponding to the user device;

determining a difference between the user device-specific bundling factor and the media bundling factor;

determining, in response to determining the difference, whether the user device-specific bundling factor overrides the media bundling factor based on whether the user device factor is set to the do not override state or the override state;

selecting, based on determining whether the user device-specific bundling factor overrides the media bundling factor, the user device-specific bundling factor or the media bundling factor to use as an actual bundling factor, wherein the actual bundling factor specifies a second number of media frames bundled in one data packet; and

bundling the media frames into the data packet according to the actual bundling factor.

2. The method of claim **1**, wherein, when the user device factor corresponds to the do not override state, the selecting further comprises selecting the media bundling factor to use as the actual bundling factor; and

when the user device factor corresponds to the override state, the selecting further comprises selecting the user device-specific bundling factor to use as the actual bundling factor.

3. The method of claim **1**, further comprising transmitting the data packet with the bundled media frames from the user device to the communication server.

4. The method of claim **1**, wherein the user device factor comprises a quality of service of a subscription or a quality of service assigned to the communication.

5. The method of claim **1**, wherein the user device factor comprises at least one of a computing power or a memory size.

6. A user device capable of determining a media bundling factor for adaptively bundling media frames in a data packet transmitted between the user device and a communication server during a communication in a data communication network, wherein the user device, when ready to transmit an audio transmission to the communication server,

transmits from the user device an audio transmission request, through a base station to the communication server;

receives at the user device the media bundling factor and a control message from the communication server, wherein the media bundling factor specifies a first number of media frames bundled in one data packet;

checks a user device factor that defines an internal operating condition or a user-specific characteristic corresponding to the user device, wherein the user device comprises a do not override state or an override state;

identifies a user device-specific bundling factor corresponding to the user device factor, wherein the user device-specific bundling factor is respectively set according to the internal operating condition or the user-specific characteristic corresponding to the user device;

determines a difference between the user device-specific bundling factor and the media bundling factor;

determines, in response to determining the difference, whether the user device-specific bundling factor overrides the media bundling factor based on whether the user device factor is set to the do not override state or the override state;

selects, based on determining whether the user device-specific bundling factor overrides the media bundling factor, the user device-specific bundling factor or the media bundling factor to use as an actual bundling factor, wherein the actual bundling factor specifies a second number of media frames bundled in one data packet; and

bundles the media frames into the data packet according to the actual bundling factor.

7. The user device of claim **6**, wherein the user device selects the media bundling factor to use as the actual bundling factor when the user device factor corresponds to the do not override state and selects the user device-specific bundling factor to use as the actual bundling factor when the user device factor corresponds to the override state.

8. The user device of claim **6**, wherein the user device transmits the data packet with the bundled media frames from the user device to the communication server.

9. The user device of claim **6**, wherein the user device further sends a message with a preferred bundling factor to the communication server.

10. The user device of claim **6**, further comprising a user profile comprising the user device factor.

11. The user device of claim **6**, wherein the user device factor includes a call priority.

12. The user device of claim **6**, wherein the user device factor comprises a quality of service of a subscription.

13. The user device of claim **6**, wherein the user device factor comprises a quality of service assigned to the communication.

14. The user device of claim 6, wherein the user device factor comprises a bundling factor set by a user of the user device.

15. The user device of claim 6, wherein the actual bundling factor comprises a first value if the media frames correspond to an initial talk segment for the communication or a second value if the media frames correspond to a non-initial talk segment for the communication.

16. The user device of claim 15, wherein the first value is less than the second value.

17. The user device of claim 6, wherein the user device factor comprises at least one of a computing power or a memory size.

18. A non transitory computer-readable medium on which is stored a computer program for determining a media bundling factor for adaptively bundling media frames in a data packet transmitted between a communication server and a user device during a communication in a data communication network, the computer program comprising computer instructions that when executed perform actions of:

transmitting from the user device an audio transmission request to the communication server;

receiving at the user device the media bundling factor and a control message from the communication server, wherein the media bundling factor specifies a first number of media frames bundled in one data packet;

checking a user device factor that defines an internal operating condition or a user-specific characteristic corresponding to the user device, wherein the user device factor comprises a do not override state or an override state;

identifying a user device-specific bundling factor corresponding to the user device factor, wherein the user device-specific bundling factor is respectively set according to the internal operating condition or the user-specific characteristic corresponding to the user device;

determining a difference between the user device-specific bundling factor and the media bundling factor;

determining, in response to determining the difference, whether the user device-specific bundling factor overrides the media bundling factor based on whether the user device factor is set to the do not override state or the override state;

selecting, based on determining whether the user device-specific bundling factor overrides the media bundling factor, the user device-specific bundling factor or the media bundling factor to use as an actual bundling factor, wherein the actual bundling factor specifies a second number of media frames bundled in one data packet; and

bundling the media frames into the data packet according to the actual bundling factor.

19. The non transitory computer-readable medium of claim 18, wherein the computer instructions when executed further perform actions of:

selecting the media bundling factor to use as the actual bundling factor when the user device factor corresponds to the do not override state; and

selecting the user device-specific bundling factor to use as the actual bundling factor when the user device factor corresponds to the override state.

20. The non transitory computer-readable medium of claim 18, wherein the computer instructions when executed further perform an action of transmitting the data packet with the bundled media frames from the user device to the communication server.

21. A user device capable of determining a media bundling factor for adaptively bundling media frames in a data packet transmitted between the user device and a communication server during a communication in a data communication network, the user device comprising:

means for transmitting from the user device an audio transmission request to the communication server;

means for receiving at the user device the media bundling factor and a control message from the communication server, wherein the media bundling factor specifies a first number of media frames bundled in one data packet;

means for checking a user device factor that defines an internal operating condition or a user-specific characteristic corresponding to the user device, wherein the user device factor comprises a do not override state or an override state;

means for identifying a user device-specific bundling factor corresponding to the user device factor, wherein the user device-specific bundling factor is respectively set according to the internal operating condition or the user-specific characteristic corresponding to the user device;

means for determining a difference between the user device-specific bundling factor and the media bundling factor;

means for determining, in response to determining the difference, whether the user device-specific bundling factor overrides the media bundling factor based on whether the user device factor is set to the do not override state or the override state;

means for selecting, based on determining whether the user device-specific bundling factor overrides the media bundling factor, the user device-specific bundling factor or the media bundling factor to use as determine an actual bundling factor, wherein the actual bundling factor specifies a second number of media frames bundled in one data packet; and

means for bundling the media frames into the data packet according to the actual bundling factor.

22. The user device of claim 21, further comprising:

means for selecting the media bundling factor to use as the actual bundling factor when the user device factor corresponds to the do not override state; and

means for selecting the user device-specific bundling factor to use as the actual bundling factor when the user device factor corresponds to the override state.

23. The user device of claim 21, further comprising means for transmitting the data packet with the bundled media frames from the user device to the communication server.

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